

SEQUENCE LISTING



<110> BROUN, Pierre  
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SOMERVILLE, Chris

<120> PRODUCTION OF HYDROXYLATED FATTY ACIDS IN GENETICALLY  
MODIFIED PLANTS

<130> 20263/255164

<140> 09/117,921

<141> 1999-03-04

<150> 08/597,313

<151> 1996-02-06

<150> PCT/US97/02187

<151> 1997-02-06

<160> 15

<170> PatentIn Ver. 2.1

<210> 1

<211> 30

<212> DNA

<213> Lesquerella fendleri

<400> 1

<210> 2

<211> 25

<212> DNA

<213> Lesquerella fendleri

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ccagaagctt tggcacaacc atatc

25

<210> 3

<211> 20

<212> DNA

<213> Lesquerella fendleri

<400> 3

ttcattaaag aggagaaatt

20

<210> 4

<211> 384

<212> PRT

<213> Lesquerella fendleri

<400> 4

RECEIVED  
FEB 24 2001  
TC 1600 MAIL ROOM

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FEB 24 2001  
TC 1600 MAIL ROOM

Met	Gly	Ala	Gly	Gly	Arg	Ile	Met	Val	Thr	Pro	Ser	Ser	Lys	Lys	Ser	1	5	10	15
Glu	Thr	Glu	Ala	Leu	Lys	Arg	Gly	Pro	Cys	Glu	Lys	Pro	Pro	Phe	Thr	20	25	30	
Val	Lys	Asp	Leu	Lys	Lys	Ala	Ile	Pro	Gln	His	Cys	Phe	Lys	Arg	Ser	35	40	45	
Ile	Pro	Arg	Ser	Phe	Ser	Tyr	Leu	Leu	Thr	Asp	Ile	Thr	Leu	Val	Ser	50	55	60	
Cys	Phe	Tyr	Tyr	Val	Ala	Thr	Asn	Tyr	Phe	Ser	Leu	Leu	Pro	Gln	Pro	65	70	75	80
Leu	Ser	Thr	Tyr	Leu	Ala	Trp	Pro	Leu	Tyr	Trp	Val	Cys	Gln	Gly	Cys	85	90	95	
Val	Leu	Thr	Gly	Ile	Trp	Val	Ile	Gly	His	Glu	Cys	Gly	His	His	Ala	100	105	110	
Phe	Ser	Asp	Tyr	Gln	Trp	Val	Asp	Asp	Thr	Val	Gly	Phe	Ile	Phe	His	115	120	125	
Ser	Phe	Leu	Leu	Val	Pro	Tyr	Phe	Ser	Trp	Lys	Tyr	Ser	His	Arg	Arg	130	135	140	
His	His	Ser	Asn	Asn	Gly	Ser	Leu	Glu	Lys	Asp	Glu	Val	Phe	Val	Pro	145	150	155	160
Pro	Lys	Lys	Ala	Ala	Val	Lys	Trp	Tyr	Val	Lys	Tyr	Leu	Asn	Asn	Pro	165	170	175	
Leu	Gly	Arg	Ile	Leu	Val	Leu	Thr	Val	Gln	Phe	Ile	Leu	Gly	Trp	Pro	180	185	190	
Leu	Tyr	Leu	Ala	Phe	Asn	Val	Ser	Gly	Arg	Pro	Tyr	Asp	Gly	Phe	Ala	195	200	205	
Ser	His	Phe	Phe	Pro	His	Ala	Pro	Ile	Phe	Lys	Asp	Arg	Glu	Arg	Leu	210	215	220	
Gln	Ile	Tyr	Ile	Ser	Asp	Ala	Gly	Ile	Leu	Ala	Val	Cys	Tyr	Gly	Leu	225	230	235	240
Tyr	Arg	Tyr	Ala	Ala	Ser	Gln	Gly	Leu	Thr	Ala	Met	Ile	Cys	Val	Tyr	245	250	255	
Gly	Val	Pro	Leu	Leu	Ile	Val	Asn	Phe	Phe	Leu	Val	Leu	Val	Thr	Phe	260	265	270	
Leu	Gln	His	Thr	His	Pro	Ser	Leu	Pro	His	Tyr	Asp	Ser	Thr	Glu	Trp	275	280	285	
Glu	Trp	Ile	Arg	Gly	Ala	Leu	Val	Thr	Val	Asp	Arg	Asp	Tyr	Gly	Ile	290	295	300	

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FEB 24 2003  
TC 1600 MAIL ROOM

Leu Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His  
 305 310 315 320

Leu Phe Ala Thr Ile Pro His Tyr Asn Ala Met Glu Ala Thr Glu Ala  
 325 330 335

Ile Lys Pro Ile Leu Gly Asp Tyr Tyr His Phe Asp Gly Thr Pro Trp  
 340 345 350

Tyr Val Ala Met Tyr Arg Glu Ala Lys Glu Cys Leu Tyr Val Glu Pro  
 355 360 365

Asp Thr Glu Arg Gly Lys Lys Gly Val Tyr Tyr Tyr Asn Asn Lys Leu  
 370 375 380

<210> 5

<211> 387

<212> PRT

<213> Ricinus communis

<400> 5

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Pro Pro Phe Thr Leu Gly Asp Leu Lys Arg Ala Ile Pro Pro His Cys  
 35 40 45

Phe Glu Arg Ser Phe Val Arg Ser Phe Ser Tyr Val Ala Tyr Asp Val  
 50 55 60

Cys Leu Ser Phe Leu Phe Tyr Ser Ile Ala Thr Asn Phe Phe Pro Tyr  
 65 70 75 80

Ile Ser Ser Pro Leu Ser Tyr Val Ala Trp Leu Val Tyr Trp Leu Phe  
 85 90 95

Gln Gly Cys Ile Leu Thr Gly Leu Trp Val Ile Gly His Glu Cys Gly  
 100 105 110

His His Ala Phe Ser Glu Tyr Gln Leu Ala Asp Asp Ile Val Gly Leu  
 115 120 125

Ile Val His Ser Ala Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser  
 130 135 140

His Arg Arg His His Ser Asn Ile Gly Ser Leu Glu Arg Asp Glu Val  
 145 150 155 160

Phe Val Pro Lys Ser Lys Ser Lys Ile Ser Trp Tyr Ser Lys Tyr Ser  
 165 170 175

Asn Asn Pro Pro Gly Arg Val Leu Thr Leu Ala Ala Thr Leu Leu Leu  
 180 185 190  
 Gly Trp Pro Leu Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp  
 195 200 205  
 Arg Phe Ala Cys His Tyr Asp Pro Tyr Gly Pro Ile Phe Ser Glu Arg  
 210 215 220  
 Glu Arg Leu Gln Ile Tyr Ile Ala Asp Leu Gly Ile Phe Ala Thr Thr  
 225 230 235 240  
 Phe Val Leu Tyr Gln Ala Thr Met Ala Lys Gly Leu Ala Trp Val Met  
 245 250 255  
 Arg Ile Tyr Gly Val Pro Leu Leu Ile Val Asn Cys Phe Leu Val Met  
 260 265 270  
 Ile Thr Tyr Leu Gln His Thr His Pro Ala Ile Pro Arg Tyr Gly Ser  
 275 280 285  
 Ser Glu Trp Asp Trp Leu Arg Gly Ala Met Val Thr Val Asp Arg Asp  
 290 295 300  
 Tyr Gly Val Leu Asn Lys Val Phe His Asn Ile Ala Asp Thr His Val  
 305 310 315 320  
 Ala His His Leu Phe Ala Thr Val Pro His Tyr His Ala Met Glu Ala  
 325 330 335  
 Thr Lys Ala Ile Lys Pro Ile Met Gly Glu Tyr Tyr Arg Tyr Asp Gly  
 340 345 350  
 Thr Pro Phe Tyr Lys Ala Leu Trp Arg Glu Ala Lys Glu Cys Leu Phe  
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 Val Glu Pro Asp Glu Gly Ala Pro Thr Gln Gly Val Phe Trp Tyr Arg  
 370 375 380  
 Asn Lys Tyr  
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 <212> PRT  
 <213> Arabidopsis thaliana

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35	40	45
Ile Pro Arg Ser Phe Ser Tyr Leu Ile Ser Asp Ile Ile Ile Ala Ser		
50	55	60
Cys Phe Tyr Tyr Val Ala Thr Asn Tyr Phe Ser Leu Leu Pro Gln Pro		
65	70	75 80
Leu Ser Tyr Leu Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val		
	85	90 95
Leu Thr Gly Ile Trp Val Ile Ala His Glu Cys Gly His His Ala Phe		
	100	105 110
Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser		
	115	120 125
Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His		
	130	135 140
His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys		
145	150	155 160
Gln Lys Ser Ala Ile Lys Trp Tyr Gly Lys Tyr Leu Asn Asn Pro Leu		
	165	170 175
Gly Arg Ile Met Met Leu Thr Val Gln Phe Val Leu Gly Trp Pro Leu		
	180	185 190
Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Phe Ala Cys		
	195	200 205
His Phe Phe Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu Gln		
	210	215 220
Ile Tyr Leu Ser Asp Ala Gly Ile Leu Ala Val Cys Phe Gly Leu Tyr		
225	230	235 240
Arg Tyr Ala Ala Ala Gln Gly Met Ala Ser Met Ile Cys Leu Tyr Gly		
	245	250 255
Val Pro Leu Leu Ile Val Asn Ala Phe Leu Val Leu Ile Thr Tyr Leu		
	260	265 270
Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp Asp		
	275	280 285
Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile Leu		
	290	295 300
Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His Leu		
305	310	315 320
Phe Ser Thr Met Pro His Tyr Asn Ala Met Glu Ala Thr Lys Ala Ile		
	325	330 335
Lys Pro Ile Leu Gly Asp Tyr Tyr Gln Phe Asp Gly Thr Pro Trp Tyr		

340 345 350  
 Val Ala Met Tyr Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro Asp  
 355 360 365  
 Arg Glu Gly Asp Lys Lys Gly Val Tyr Trp Tyr Asn Asn Lys Leu  
 370 375 380  
  
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 <211> 384  
 <212> PRT  
 <213> Brassica napus  
  
 <220>  
 <221> PEPTIDE  
 <222> (1)..(384)  
 <223> encodes for hydroxylase enzyme for Brassica napus  
  
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 Glu Thr Asp Asn Ile Lys Arg Val Pro Cys Glu Thr Pro Pro Phe Thr  
 20 25 30  
 Val Gly Glu Leu Lys Lys Ala Ile Pro Pro His Cys Phe Lys Arg Ser  
 35 40 45  
 Ile Pro Arg Ser Phe Ser His Leu Ile Trp Asp Ile Ile Ile Ala Ser  
 50 55 60  
 Cys Phe Tyr Tyr Val Ala Thr Thr Tyr Phe Pro Leu Leu Pro Asn Pro  
 65 70 75 80  
 Leu Ser Tyr Phe Ala Trp Pro Leu Tyr Trp Ala Cys Gln Gly Cys Val  
 85 90 95  
 Leu Thr Gly Val Trp Val Ile Ala His Glu Cys Gly His Ala Ala Phe  
 100 105 110  
 Ser Asp Tyr Gln Trp Leu Asp Asp Thr Val Gly Leu Ile Phe His Ser  
 115 120 125  
 Phe Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr Ser His Arg Arg His  
 130 135 140  
 His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Arg  
 145 150 155 160  
 Arg Ser Gln Thr Ser Ser Gly Thr Ala Ser Thr Ser Thr Thr Phe Gly  
 165 170 175  
 Arg Thr Val Met Leu Thr Val Gln Phe Thr Leu Gly Trp Pro Leu Tyr  
 180 185 190  
 Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp Gly Gly Phe Ala Cys

195	200	205
His Phe His Pro Asn Ala Pro Ile Tyr Asn Asp Arg Glu Arg Leu Gln		
210	215	220
Ile Tyr Ile Ser Asp Ala Gly Ile Leu Ala Val Cys Tyr Gly Leu Leu		
225	230	235 240
Pro Tyr Ala Ala Val Gln Gly Val Ala Ser Met Val Cys Phe Leu Arg		
	245	250 255
Val Pro Leu Leu Ile Val Asn Gly Phe Leu Val Leu Ile Thr Tyr Leu		
	260	265 270
Gln His Thr His Pro Ser Leu Pro His Tyr Asp Ser Ser Glu Trp Asp		
	275	280 285
Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile Leu		
	290	295 300
Asn Gln Gly Phe His Asn Ile Thr Asp Thr His Glu Ala His His Leu		
305	310	315 320
Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Lys Ala Ile		
	325	330 335
Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Gly Thr Pro Val Val		
	340	345 350
Lys Ala Met Trp Arg Glu Ala Lys Glu Cys Ile Tyr Val Glu Pro Asp		
	355	360 365
Arg Gln Gly Glu Lys Lys Gly Val Phe Trp Tyr Asn Asn Lys Leu Xaa		
370	375	380

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 <211> 309  
 <212> PRT  
 <213> Glycine max

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 Phe Ile Phe Tyr Ile Ala Thr Thr Tyr Phe His Leu Leu Pro Gln Pro  
 20 25 30  
 Phe Ser Leu Ile Ala Trp Pro Ile Tyr Trp Val Leu Gln Gly Cys Leu  
 35 40 45  
 Leu Thr Arg Val Cys Gly His His Ala Phe Ser Lys Tyr Gln Trp Val  
 50 55 60

Asp Asp Val Val Gly Leu Thr Leu His Ser Thr Leu Leu Val Pro Tyr  
 65 70 75 80  
 Phe Ser Trp Lys Ile Ser His Arg Arg His His Ser Asn Thr Gly Ser  
 85 90 95  
 Leu Asp Arg Asp Glu Arg Val Lys Val Ala Trp Phe Ser Lys Tyr Leu  
 100 105 110  
 Asn Asn Pro Leu Gly Arg Ala Val Ser Leu Leu Val Thr Leu Thr Ile  
 115 120 125  
 Gly Trp Pro Met Tyr Leu Ala Phe Asn Val Ser Gly Arg Pro Tyr Asp  
 130 135 140  
 Ser Phe Ala Ser His Tyr His Pro Tyr Arg Val Arg Leu Leu Ile Tyr  
 145 150 155 160  
 Val Ser Asp Val Ala Leu Phe Ser Val Thr Tyr Ser Leu Tyr Arg Val  
 165 170 175  
 Ala Thr Leu Lys Gly Leu Val Trp Leu Leu Cys Val Tyr Gly Val Pro  
 180 185 190  
 Leu Leu Ile Val Asn Gly Phe Leu Val Thr Ile Thr Tyr Leu Arg Val  
 195 200 205  
 His Tyr Asp Ser Ser Glu Trp Asp Trp Leu Lys Gly Ala Leu Ala Thr  
 210 215 220  
 Met Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe His His Ile Thr  
 225 230 235 240  
 Asp Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr His  
 245 250 255  
 Leu Arg Val Lys Pro Ile Leu Gly Glu Tyr Tyr Gln Phe Asp Asp Thr  
 260 265 270  
 Pro Phe Tyr Lys Ala Leu Trp Arg Glu Ala Arg Glu Cys Leu Tyr Val  
 275 280 285  
 Glu Pro Asp Glu Gly Thr Ser Glu Lys Gly Val Tyr Trp Tyr Arg Asn  
 290 295 300  
 Lys Tyr Leu Arg Val  
 305

<210> 9  
 <211> 302  
 <212> PRT  
 <213> Glycine max

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 Phe Ser Tyr Val Val Tyr Asp Leu Thr Ile Ala Phe Cys Leu Tyr Tyr  
 1 5 10 15



Val Ala Thr His Tyr Phe His Leu Leu Pro Gly Pro Leu Ser Phe Arg  
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Gly Met Ala Ile Tyr Trp Ala Val Gln Gly Cys Ile Leu Thr Gly Val  
35 40 45  
Trp Val Val Ala Phe Ser Asp Tyr Gln Leu Leu Asp Asp Ile Val Gly  
50 55 60  
Leu Ile Leu His Ser Ala Leu Leu Val Pro Tyr Phe Ser Trp Lys Tyr  
65 70 75 80  
Ser His Arg Arg His His Ser Asn Thr Gly Ser Leu Glu Arg Asp Glu  
85 90 95  
Val Phe Val Pro Lys Val Ser Lys Tyr Leu Asn Asn Pro Pro Gly Arg  
100 105 110  
Val Leu Thr Leu Ala Val Thr Leu Thr Leu Gly Trp Pro Leu Tyr Leu  
115 120 125  
Ala Leu Asn Val Ser Gly Arg Pro Tyr Asp Arg Phe Ala Cys His Tyr  
130 135 140  
Asp Pro Tyr Gly Pro Ile Tyr Ser Val Ile Ser Asp Ala Gly Val Leu  
145 150 155 160  
Ala Val Val Tyr Gly Leu Phe Arg Leu Ala Met Ala Lys Gly Leu Ala  
165 170 175  
Trp Val Val Cys Val Tyr Gly Val Pro Leu Leu Val Val Asn Gly Phe  
180 185 190  
Leu Val Leu Ile Thr Phe Leu Gln His Thr His Val Ser Glu Trp Asp  
195 200 205  
Trp Leu Arg Gly Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile Leu  
210 215 220  
Asn Lys Val Phe His Asn Ile Thr Asp Thr His Val Ala His His Leu  
225 230 235 240  
Phe Ser Thr Met Pro His Tyr His Ala Met Glu Ala Thr Val Glu Tyr  
245 250 255  
Tyr Arg Phe Asp Glu Thr Pro Phe Val Lys Ala Met Trp Arg Glu Ala  
260 265 270  
Arg Glu Cys Ile Tyr Val Glu Pro Asp Gln Ser Thr Glu Ser Lys Gly  
275 280 285  
Val Phe Trp Tyr Asn Asn Lys Leu Ala Met Glu Ala Thr Val  
290 295 300

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<211> 372  
 <212> PRT  
 <213> Zea mays

<220>  
 <221> PEPTIDE  
 <222> (372)  
 <223> Desaturase

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Glu Lys Pro Pro Phe Thr Leu Gly Gln Ile Lys Lys Ala Ile Pro Pro  
 35 40 45

His Cys Phe Glu Arg Ser Val Leu Lys Ser Phe Ser Tyr Val Val His  
 50 55 60

Asp Leu Val Ile Ala Ala Ala Leu Leu Tyr Phe Ala Leu Ala Ile Ile  
 65 70 75 80

Pro Ala Leu Pro Ser Pro Leu Arg Tyr Ala Ala Trp Pro Leu Tyr Trp  
 85 90 95

Ile Ala Gln Gly Ala Phe Ser Asp Tyr Ser Leu Leu Asp Asp Val Val  
 100 105 110

Gly Leu Val Leu His Ser Ser Leu Met Val Pro Tyr Phe Ser Trp Lys  
 115 120 125

Tyr Ser His Arg Arg His His Ser Asn Thr Gly Ser Leu Glu Arg Asp  
 130 135 140

Glu Val Phe Val Pro Lys Lys Lys Glu Ala Leu Pro Trp Tyr Thr Pro  
 145 150 155 160

Tyr Val Tyr Asn Asn Pro Val Gly Arg Val Val His Ile Val Val Gln  
 165 170 175

Leu Thr Leu Gly Trp Pro Leu Tyr Leu Ala Thr Asn Ala Ser Gly Arg  
 180 185 190

Pro Tyr Pro Arg Phe Ala Cys His Phe Asp Pro Tyr Gly Pro Ile Tyr  
 195 200 205

Asn Asp Arg Glu Arg Ala Gln Ile Phe Val Ser Asp Ala Gly Val Val  
 210 215 220

Ala Val Ala Phe Gly Leu Tyr Lys Leu Ala Ala Ala Phe Gly Val Trp  
 225 230 235 240

Trp Val Val Arg Val Tyr Ala Val Pro Leu Leu Ile Val Asn Ala Trp  
 245 250 255

Leu Val Leu Ile Thr Tyr Leu Gln His Thr His Pro Ser Leu Pro His  
                   260                                  265                                  270  
 Tyr Asp Ser Ser Glu Trp Asp Trp Leu Arg Gly Ala Leu Ala Thr Met  
                   275                                  280                                  285  
 Asp Arg Asp Tyr Gly Ile Leu Asn Arg Val Phe His Asn Ile Thr Asp  
                   290                                  295                                  300  
 Thr His Val Ala His His Leu Phe Ser Thr Met Pro His Tyr His Ala  
 305                                  310                                  315                                  320  
 Met Glu Ala Thr Lys Ala Ile Arg Pro Ile Leu Gly Asp Tyr Tyr His  
                                   325                                  330                                  335  
 Phe Asp Pro Thr Pro Val Ala Lys Ala Thr Trp Arg Glu Ala Gly Glu  
                                   340                                  345                                  350  
 Cys Ile Tyr Val Glu Pro Glu Asp Arg Lys Gly Val Phe Trp Tyr Asn  
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 Lys Lys Phe Xaa  
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 <213> Ricinus communis

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                   20                                  25                                  30  
 Pro Tyr Phe Ser Trp Lys His Ser His Arg Arg His His Ser Asn Thr  
                   35                                  40                                  45  
 Gly Ser Leu Glu Arg Asp Glu Val Phe Val Pro Lys Lys Lys Ser Ser  
           50                                  55                                  60  
 Ile Arg Trp Tyr Ser Lys Tyr Leu Asn Asn Pro Pro Gly Arg Ile Met  
           65                                  70                                  75                                  80  
 Thr Ile Ala Val Thr Leu Ser Leu Gly Trp Pro Leu Tyr Leu Ala Phe  
                                   85                                  90                                  95  
 Asn Val Ser Gly Arg Pro Tyr Asp Arg Phe Ala Cys His Tyr Asp Pro  
                   100                                  105                                  110  
 Tyr Gly Pro Ile Tyr Asn Asp Arg Glu Arg Ile Glu Ile Phe Ile Ser  
           115                                  120                                  125  
 Asp Ala Gly Val Leu Ala Val Thr Phe Gly Leu Tyr Gln Leu Ala Ile

130                      135                      140  
 Ala Lys Gly Leu Ala Trp Val Val Cys Val Tyr Gly Val Pro Leu Leu  
 145                      150                      155                      160  
 Val Val Asn Ser Phe Leu Val Leu Ile Thr Phe Leu Gln His Thr His  
                     165                      170                      175  
 Pro Ala Leu Pro His Tyr Asp Ser Ser Glu Trp Asp Trp Leu Arg Gly  
                     180                      185                      190  
 Ala Leu Ala Thr Val Asp Arg Asp Tyr Gly Ile Leu Asn Lys Val Phe  
                     195                      200                      205  
 His Asn Ile Thr Asp Thr Gln Val Ala His His Leu Phe Thr Met Pro  
                     210                      215                      220

<210> 12  
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 <212> DNA  
 <213> Ricinus communis

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<210> 13  
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 <212> DNA  
 <213> Artificial Sequence

<220>  
 <223> Description of Artificial Sequence: homologous  
                     regions of Ricinus communis deduced by hydroxylase  
                     sequence and Arabidopsis thaliana deduced desaturase  
                     sequence for use as oligonucleotide primer

<400> 13  
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<210> 14  
 <211> 20  
 <212> DNA  
 <213> Artificial Sequence

<220> <223> Description of Artificial Sequence: homologous  
                     regions of Ricinus communis deduced by hydroxylase  
                     sequence and Arabidopsis thaliana deduced desaturase  
                     sequence for use as oligonucleotide primer

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<222> (1)..(20)

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<210> 15

<211> 21

<212> DNA

<213> Artificial Sequence

<220>

<223> Description of Artificial Sequence: homologous  
regions of Ricinus communis deduced by hydroxylase  
sequence and Arabidopsis thaliana deduced desaturase  
sequence for use as oligonucleotide primer

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rtgrtgngcn acrtgngtrt c

21